

A NATURAL SANDFLY REPELLENT DEVELOPED FROM *GENIPA AMERICANA* "HUITO" (RUBIACEAE) IN PERU

LUTZOMYIA VERRUCARUM COLONY

Lutzomyia verrucarum is reared under controlled conditions in the Instituto de Medicina Tropical Alexander von Humboldt, Universidad Peruana Cayetano Heredia. The colony was initiated with individuals collected on October 1997 in Chaute (Huarochiri, Lima), at an altitude of 2500 m, an endemic area for Andean cutaneous leishmaniasis "uta" and bartonellosis "verruca peruana". The colony is maintained constantly at a temperature of 19-20 °C. The rearing technique we follow was suggested by Lawyer et al. (1991).



DATA ANALYSIS

The Percentage of Repellency (R) is calculated with an adaptation of the formula suggested by Jantan & Zaki (1998):

$$R = (C-T)/C \times 100$$

where C is the number of *Lutzomyia* which fed on the control mouse, and T is the number of *Lutzomyia* which fed on the mouse treated with a "huito" preparation.

RESULTS

The aqueous extracts of unripe fruits of *G. americana* "huito" at the dilution used (0.1 g/ml) are odorless, and when the pigment is removed, the extracts do not show any color, even when applied to the skin. The results of the repellency assays are presented in Table 2.

TABLE 2. Repellency obtained from bioassays of extractions of unripe *Genipa americana* "huito" fruits with colonized *Lutzomyia verrucarum*.

PREPARATION:	SOURCE OF SANDFLIES			
	COLONY		FIELD	
	n	% R	n	% R
1	5	4		
2	5	12		
3	17	85.29	10	88.88
4	3	88.88		
5	14	80.71		
6	14	88.88		
7	3	66.66		
8	3	70.36		
FRACTION:				
Methanol	3	66.66		
Hexane	3	76.66		
Chloroform	3	66.66		
Dichloromethane	3	83.33		

n= number of repetitions of the bioassay.

RESULTS (continued)

The heated aqueous extract with pigment (88.88%, n=3), and the ethanolic fraction of the aqueous extract (88.88%, n=14) showed the highest repellency rate, under laboratory conditions. (The unheated aqueous extract with pigment showed 88.88%, n=10 in the field with wild caught sandflies). The repellency decreased with the aqueous extract without pigment (80.71%, n=14).

The repellency with fractions at a concentration of 0.1 g/ml was: Methanol 66.66 %, Hexane 76.66, Chloroform 66.66 %, and Dichloromethane 83.33 %, (n=3).

The repellency with preparations using huito skin decreases to 66-70%, suggesting that the active compound is more concentrated in the pulp.

TIME: When mice were exposed to sandflies for 10 minutes after the "huito" preparation was spread on the shaved abdomen, the sandflies fed normally, but when the mice were left for 40-60 minutes and then exposed, almost none fed.

ANTI-FEEDING PROPERTY: Repellency bioassays were carried out with 2 mice, one treated with aqueous extract without pigment, and a control mouse, both were placed together on the top of a feeding cage. We observed that the sandflies fed only on the control mouse.

These results indicate that the pulp of unripe fruits of *Genipa americana* "huito" has an anti-feeding compound, preventing the sandflies from biting.

DISCUSSION

Aqueous extractions of *G. americana* "huito" are natural products with no known side effects on the skin or other human organs. Extracts like that are currently used by the inhabitants of native communities in the Amazonian region for different medical purposes including the protection against insect bites. This ancestral knowledge has been handed down from generation to generation.

A repellent is used to avoid the contact between biting insect and human. This not only reduces the number of bites received, but also the probability of transmission of pathogens.

The importance of repellents is that they protect people while they are not inside their bednets or sprayed houses, i.e. during outdoor activities (agriculture, irrigation) or when escaping the uncomfortably warm temperature inside the houses. Unfortunately, this time coincides with the hours of the highest sandfly activity (18:00-22:00).

We suggest the frequent use of a repellent based on aqueous extracts of unripe fruits of *Genipa americana* "huito" as a method for personal protection against sandflies and other insects. It is easy to prepare and inexpensive. All these features make the huito repellent we developed here a recommendable tool for the control of sandflies at least in the Amazonian areas. The preparation without pigment (color and odorless) would also be very attractive to the general population, not just for the native population who normally use huito with the pigment.

CONCLUSIONS

- The aqueous extract of unripe fruits of *Genipa americana* "huito":
 - with and without pigment has the highest repellent effect (80-88%) against colonized *Lutzomyia verrucarum*;
 - has an anti-feeding compound, which does not allow *Lutzomyia* to feed on treated skin;
 - will be the starting point for the development and designing of an insect repellent;
 - is traditionally used by the native communities, does not seem to have side effects in humans, and can be used extensively.

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